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AUTHOR Kauchak, Don; And Others
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ABSTRACT

A study was conducted to determine whether students at different grade levels could use categorical cues to encode information from prose text. Sixty college students, 74 high school students, 96 junior high school students, and 108 third grade students read a 12-paragraph passage containing two references to color and number per paragraph. The students in the experimental condition were told to remember colors for the first six paragraphs and numbers for the next six paragraphs. Students in the control condition were told only to read the passage. All students were administered a posttest that measured retention of color-related information, number-related information, and information incidental to color or number. Results indicated that the use of categorical cues did not influence the total amount learned from a passage at the junior high, senior high, or college levels, but did significantly reduce the total amount of learning at the third grade level. The findings also indicated that explicit categorical cues were ineffective with junior high students and had a deleterious effect on the reading behaviors of third grade students. The pattern was reversed at the college level, suggesting that selective reading strategies are present in college students and can be induced by questions or evoked by direct categorical cues. (FL)

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A DEVELOPMENTAL STUDY OF CATEGORICAL READING CUE EFFECTIVENESS

DON KAUCHAK
KEN PETERSON
University of Utah

PAUL EGGEN
SANDRA KIRK
University of North Florida

Abstract

Can students at different grade levels use categorical cues to encode information from prose text? Third grade, junior high school, high school and senior college students (N = 338) read a thousand word, twelve paragraph passage, containing two references to color and number per paragraph. Treatment Ss were instructed to remember colors for the first six paragraphs and numbers for the second; control Ss read the passage. Developmental factors affecting categorical cue effectiveness were suggested by third grade controls scoring significantly higher on cued color and number post subtests and by significant differences in favor of college level treatment groups on these subtests.

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A number of studies (Melton, 1978; Faw and Waller, 1977; Rothkopf, 1970) have shown the effectiveness of cues in learning from written materials. The effectiveness of such cues has been explained by their ability to induce searching or scanning behaviors in the readers. Research by Frase (1968) suggests that these selective reading behaviors in college students are not learned at the time when cues are first encountered in college but rather acquired at an earlier time and evoked by cues inserted in texts. In this study Frase found that the effects of inserted questions were not cumulative, but present from the first paragraph on.

Research with college students (Rothkopf and Bisbicos, 1967) has shown that textual cues can induce topographic behaviors, i.e., questions focusing upon specific items within categories of information result in encoding of similar items within that category. The researchers interpreted these results in terms of modification of inspection behaviors in which category-oriented questions provide selective contingencies. Indirect evidence for a selective attention interpretation of categorical cues was obtained by Reynolds et al (1979). In this study Ss who received inserted questions spent more time on the parts of the text that contained information of the type needed to answer the questions.

When the ability to selectively encode categories of information develops and whether these selective reading behaviors can be evoked by explicit directions is not known. The purpose of this study was to investigate the effectiveness of explicit categorical cues on third grade, junior high, senior high and college students' reading behaviors.

METHOD

Materials: A 1,000 word fictitious passage containing 12 paragraphs about a dragon was constructed. Each paragraph in the passage contained two references to colors and two references to numbers. Atypical color references (e.g. The grass was blue.) were selected to prevent Ss' prior knowledge of the information, and the numbers used ranged from one to twelve. All numbers appeared as words in the passage.

Design and Procedures: The passage was divided into two sections equal in length. Ss in the experimental group were instructed to remember colors in the first six paragraphs that they read and numbers in the second six paragraphs. The control group was asked to read carefully but was given no specific type of content to focus on. Both groups were instructed to read the passage only once and were told that a post test covering information in the text would be administered immediately afterwards.

Subject: Ss for the study were 108 third graders, 96 seventh and eighth graders, 74 eleventh and twelfth grade students and 60 senior college students. Ss at the elementary and secondary levels came from middle SES schools in the Salt Lake City, Utah area; college students were senior level education students at the University of Utah. Ss at all levels were randomly assigned within classes to one of two treatments.

Data Source: A completion format post test consisting of thirty items was constructed. Twelve items measured retention of information relating to colors in each of the paragraphs; twelve measured retention of information related to number; and six items measured retention of information incidental to color or number. Color and number subtests

were further divided into cued and non-cued sections with six items in each.

Data Analysis: Because of the interest in developmental differences in the effects of the cueing treatment, interaction effects between treatment and grade level were examined with F tests for each subtest. Next, a priori orthogonal tests using the t ratio (Kirk, 1968) were made between mean subtest and total test scores by treatment, cued or control, at each grade level. Finally, the relative effectiveness of the treatment on subtests and total test for each grade level was examined by calculating the respective ratios of mean cued scores to mean control scores.

FINDINGS

Statistically significant interactions between grade level and treatment were found for the cued color subtest ($F = 14.9$; $df = 1,3$; $p = < .01$), cued number subtest ($F = 10.8$; $df = 1,3$; $p = < .01$) and total test ($F = 6.0$; $df = 1,3$; $p = < .01$). There were no significant grade level treatment interactions on the incidental information subtest ($F = 1.8$; $df = 1,3$; $p = < .15$), the non-cued color subtest ($F = 1.53$; $df = 1,3$; $p = < .20$), or the non-cued number subtest ($F = 1.37$; $df = 1,3$; $p = < .25$). Cued subtest and total test scores and significance findings of differences of means by treatment at each grade level are presented in Table 1.

- Table 1 here -

Total test scores and significance tests of differences of means by treatment for the third graders revealed that the control group scored significantly higher than the cued group. Total scores for the cued and control groups at the junior and senior high levels were nearly identical

and there was a small advantage for the cued college subgroup on total scores, but this difference was not significant.

Subtest scores for cued color and number subtests revealed differences in response patterns both by grade level and item type. Cued third grade Ss scored significantly higher than controls on each cued subtest. Treatment junior high school cued subtest scores were not statistically different from controls, but cued high school Ss had significantly higher cued color subtest scores, and higher but not statistically significant number subtest scores. Cued college students showed significantly higher scores on both cued subtests.

- Table 2 here -

On non-cued color, number and incidental information subtests, third grade control Ss scored significantly higher on all three subtests. Junior high control Ss scored significantly higher on the non-cued number and incidental subtests and high school controls scored significantly higher on the non-cued color subtest and on the incidental information subtest. There were no significant differences between college treatment and control groups on the non-cued or incidental subtests.

Table 3 presents effectiveness ratios for the cued and non-cued subtests, incidental information subtest, and total test by grade level. This ratio was obtained by dividing cued treatment group scores by controls'. A ratio of less than 1.00 indicates that the cueing depressed scores, a value greater than 1.00 indicates enhancement of scores. The use of cues depressed scores for third graders on all subtests and the total test. For junior high Ss the treatment depressed incidental and non-cued subtest scores, but did not greatly affect other scores. Cueing enhanced high

school Ss' cued subtest scores and depressed incidental and non-cued subtest scores. College treatment Ss showed the same pattern with enhancement of cued subtests and the depression of non-cued subtests and a small advantage on the total test score.

- Table 3 here -

CONCLUSIONS

Development of the ability to selectively scan for and encode information from text materials has theoretical significance for researchers attempting to document and explain the emergence of sophisticated reading strategies in learners as well as practical importance for instructors interested in having students learn specific kinds of information from text materials.

Comparisons of treatment and control total test scores revealed that the use of categorical cues does not influence the total amount learned from a passage at the junior high, senior high or college level but can significantly reduce the total amount learned from a prose passage at the third grade level.

Comparisons of cued subtest scores indicated that explicit categorical cues are not only ineffective with junior high students, but have a deleterious effect on the reading behaviors of third grade students. This pattern reversed itself at the college level, suggesting that selective reading strategies are present in college students and can be induced by questions (Rothkopf and Bisbicos, 1967), or evoked by direct categorical cues as occurred in the present study. The deleterious effect of the cues on third grade Ss' reading behavior, as evidenced by significant differences on all subtests as well as total score, suggests that asking

students to use non-existent or poorly developed reading strategies can result in decreases in reading performance.

Significant differences in favor of controls on non-cued and incidental questions at the lower three levels can be interpreted in two ways. One is that the selective scanning of the treatment groups caused these Ss to fail either to encode or remember incidental information. This interpretation is most plausible at the junior and senior high levels where selective scanning is suggested by higher treatment scores on three of the cued subtests and a significant difference on one of the cued subtests. An alternate interpretation of the significant difference in favor of third grade controls on the non-cued and incidental subtests is that the treatment disrupted normal reading behaviors. Support for this interpretation at the third grade level can be found in the controls' significantly higher scores on the cued subtests and total test score. Interestingly, at the college level, non-significant decrements were found on non-cued subtests but not on the incidental information subtest. One possible interpretation of these results is that college treatment Ss interpreted directions to encode specific categories of information as implicit directions <u>not</u> to encode other easily identifiable categories of information. That this decrement did not occur on the incidental subtest suggests that a category specific rejection mechanism, if it exists, is dependent upon the rejected material being easily identifiable.

The significant difference between treatment and controls on the third grade total scores has practical implications for those attempting to use categorical cues to influence reading behaviors. The results of the present study indicate that with younger students, certain types of

cues can decrease the total amount learned from text. The lack of significant difference in total scores at the junior high, high school and college levels, coupled with significant differences on certain subtests, suggests that at these levels the total amount learned may not be affected by categorical cues but the kinds of information learned can be.

The results of this study also call into question the interpretation of results in other studies involving textual cues. The majority of these studies have employed college students as Ss and, while individual researchers in the area have been careful to generalize their results to appropriate target populations, there has been a tendency for reviewers and theorists to extend these results to readers in general. Present findings question the validity of those extensions and suggest the need for increased developmental investigations.

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TABLE 1

Cued Subtest and Total Test Scores with Significance Test by Treatment at Each Grade Level

			SUBTEST						TOTAL TEST		
			Cued Color			Cued Number					
Grade Level	Treatment	N	$\bar{x}$	(S.D.)	p	$\bar{x}$	(S.D.)	p	$\bar{x}$	(S.D.)	p
Third Grade	cued	52	2.67	(1.37)	.03	1.35	(1.30)	< .01	9.9	(4.7)	< .01
	uncued	56	3.29	(1.55)		2.02	(1.21)		13.7	(4.8)	
Junior High	cued	44	4.61	(1.18)	.29	3.00	(1.57)	.12	14.7	(4.7)	.96
	uncued	52	4.35	(1.28)		2.50	(1.55)		14.6	(4.2)	
High School	cued	34	4.76	(1.23)	< .01	2.89	(1.47)	.16	16.6	(4.8)	.61
	uncued	40	3.62	(1.31)		2.42	(1.32)		17.1	(4.4)	
College	cued	32	5.44	(.72)	< .01	3.06	(1.48)	.02	15.7	(4.0)	.09
	uncued	28	3.39	(1.62)		2.11	(1.62)		13.6	(5.2)	

TABLE 2

Non-Cued And Incidental Subtest Scores With Significance Test
By Treatment At Each Grade Level

Grade Level	Treatment	N	Non-Cued Color $\bar{x}$	Non-Cued Color (S.D.)	p	Non-Cued Number $\bar{x}$	Non-Cued Number (S.D.)	p	Incidental $\bar{x}$	Incidental (S.D.)	p
Third Grade	cued	52	1.50	(1.21)	.02	1.86	(1.52)	<.01	2.52	(1.36)	<.01
	uncued	56	2.05	(1.23)		3.05	(1.55)		3.30	(1.26)	
Junior High	cued	44	2.43	(1.35)	.91	3.04	(1.54)	.03	3.50	(1.13)	.02
	uncued	52	2.46	(1.18)		3.73	(1.54)		4.04	(1.17)	
High School	cued	34	2.50	(1.26)	.01	2.62	(1.72)	.42	2.91	(1.06)	.04
	uncued	40	2.22	(1.19)		2.90	(1.30)		3.45	(1.13)	
College	cued	32	1.16	(.92)	.08	2.59	(1.72)	.33	3.41	(1.16)	.76
	uncued	28	1.78	(1.62)		3.00	(1.47)		3.32	(.90)	

TABLE 3

Relative Effectiveness of Treatment:
Ratios of Mean Treatment Score to Mean Control Score
by Grade Level

Grade Level	Test					
	Cued Color	Cued Number	Non-Cued Color	Non-Cued Number	Incidental	Total
Third Grade	.81	.67	.73	.61	.76	.72
Junior High	1.06	1.20	.98	.82	.87	1.00
High School	1.31	1.19	.68	.90	.84	.97
College	1.60	1.45	.65	.86	1.03	1.15